

REMARKS

Claims 1, 20, and 22 are amended to specify that the microstructure parts (6) are not in contact with said at least one inlet opening (2). Support is found in the specification as originally filed, for example, in FIGs. 1a-d, 2a-c, 3a-d, 4a-f, 5a-b, 6b, 7a, and 8a-c and their corresponding descriptions.

Claim 4 is amended to specify that the extraction agent is introduced into and conveyed through the main channel. Support for the amendment may be found, for example, in the second-to-last sentence of the first paragraph on page 15 in the specification as originally filed, which discloses a fluid that later will constitute the continuous phase of the mixture, may be introduced through the main channel.

The specification is amended to improve the translation of "strömungsgeschwindigkeit" from "flow rate" to "flow velocity."

No new matter is added.

Claims Rejections 35 U.S.C. 103

Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hemming** (ISBN 3-8023-0084-X, pp158-9) in view of **Schubert** et al. (US 6,082,891) and in further view of **Ehrfeld** et al. (US 2003/0039169). The Examiner's rejection has been carefully considered.

I. Applicant argues that claims 1-23 are patentable over the cited prior art because the cited references, neither individually nor in combination, teach or suggest every limitation recited in claims 1, 20, and 22, as amended. Specifically, none of the references teach or suggest: [1] microstructure parts (6) that divide a linking channel

into more than two part channels immediately before opening into a single mixing zone; [2] linking channels that are divided only once immediately before opening into a single mixing zone; or [3] linking channels that are in contact with the mixing zone but not in contact with the inlet opening.

The rejection cites Hemming only as teaching the general process for extraction using at least two immiscible fluids. Hemming does not teach or suggest a micromixer or any structural components for a micromixer.

The rejection cites Schubert as teaching a micromixer having the structural elements recited in the rejected claims for a micromixer.

The rejection cites Ehrfeld as teaching micromixer components in the form a disk and asserts that one of ordinary skill would have been motivated to modify Schubert in view of Ehrfeld to make the Schubert micromixer in the form of disk-shaped components rather than polygonal-shaped components.

Regarding Schubert, it appears that the rejection equates admission chamber 7A (or at least the portion of the admission chamber that is in the plane of the plate) with inlet opening (2) recited in the rejected claims. The parallel grooves 2A and 2B (or parallel passages 3A,4B) in Schubert appear to be interpreted as equivalent to both the part channels (7) and linking channels (3) recited in the rejected claims. If this is the case, the interpretation contradicts the plain meaning of separating a (i.e. single) channel into two or more part channels.

Contrary to a single linking channel separated by microstructure parts into part channels, Schubert teaches multiple, parallel passages of equal length connecting an inlet and an outlet. Schubert, C2/L40-61 cited in the rejection, teaches "a number of arc-like grooves 2A, 2B pressed into a foil and arranged to be closely adjacent to one another. When foils are stacked, rows of passages 3A and 4B are formed. The set of grooves 2A "extends in the shape of an arc from the right rear face 6A to the center

area 6C of the front face 8A of the foil 1A.” 6A is a flat face in direct contact with fluid admission chamber 7A (FIG. 2). Viewing FIG. 1, it is clear that Schubert teaches multiple, parallel channels linking a fluid inlet with a mixing zone and not a linking channel divided by microstructure units immediately prior to opening into the mixing zone. This interpretation is entirely supported in C2/L10-24.

It appears that the outstanding rejection may be based, in part, on an interpretation that the microstructure parts (6) recited in the rejected claims encompass the walls of the separate, parallel linking channels in Schubert. Such an interpretation would be incorrect based solely upon the language recited in the rejected claims. Additionally, while limitations are not to be read from the specification into the claims, the claims are not to be interpreted in a vacuum. One of skill in the art would clearly not confuse the linking channel separated into part channels by microstructure parts recited in the rejected claims with the multiple, separate, parallel, arc-shaped channels of equal lengths between an inlet opening 7A and a mixing zone 9C taught by Schubert. Nevertheless, and solely for the purpose of advancing the prosecution of the present application, claims 1, 20, and 22 are amended to specify that the microstructure parts (6) are not in contact with the at least one inlet opening (2).

II. Applicant argues that claims 1-23 are patentable over the cited prior art because one of ordinary skill in the art, at the time the invention was made, would not have been motivated to modify the combined teachings of Hemming and Schubert according to the teachings of Ehrfeld, as suggested in the rejection.

The rejection asserts that it would have been obvious to modify the plate of Schubert to include a disk shape as opposed to a polygonal shape, since doing (so) amounts to nothing more than the substitution of one plate design for another, both of which are recognized in the art of micromixers.” Setting the lack of motivation for the asserted substitution of shapes aside, the suggested modification of the Schubert plates to be disk-shaped rather than pentagonally shaped would render the Schubert invention inoperable for its intended purpose because the resulting geometry would be

incompatible with the requirement (according to Schubert) for a pentagonal shape and flat faces where the passages meet inlets and mixing zones to maintain rows of parallel, arced passages that are of equal length (C2/L53-C3L32). This is supported by C3/L39-52, which provides the only description of manufacturing the plates for the Schubert micromixer and which describes the manufacture of pentagonal plates (see also FIG. 3). Furthermore, the specific geometry used by Schubert is taught by Schubert as having the advantage of achieving a packing density of passage openings of several thousand per square centimeter (C2/L 10-24).

The teachings of Ehrfeld do not remedy the expected inoperability of the Schubert micromixer were the pentagonally shaped plate replaced by a disk-shaped plate. Ehrfeld teaches a micromixer that requires a specific linking channel geometry that correlates with the function of providing identical volumetric flows for each fluid at the respective microchannel outflows (abstract, [0012], [0051]). The minimal sequential bifurcation required according to Ehrfeld is a two stage bifurcation. One of ordinary skill in the art would have had no reason to believe that the disk-shaped geometry used by Ehrfeld to provide identical volumetric flows for each fluid at the respective microchannel outflows would be applicable to the Schubert micromixer, which is designed to increase the local and time effectiveness of the mixing step (C1/L56-60) by leading fluid into a mixing chamber in a general flow direction and uniform mixing over the whole outlet area while there are no unused clearance volumes in the guide structure so that the density of openings may be as high as several thousand per square centimeter (C2/L10-24).

The structure and function of Schubert are inseparable: *"Because of the microstructuring of the rows of passages, the fluids to be mixed or to be dispersed are divided into a multitude of fine neighboring flow filaments or lamellas which, upon entering the mixing chamber, mix rapidly and in a short distance or are divided into a dispersant phase which forms droplets or bubbles and an enveloping phase forming a continuous phase"* (C2/L14-21). Modifying the mixer to replace multiple, parallel, linking channels of the same length with a single linking channel divided into more than two channels

immediately prior to opening into the mixing zone, as recited in the rejected claims, would be in complete contradiction to the disclosed operating principle taught by Schubert.

In view of the foregoing arguments and the amendment to claims 1, 20, and 22, Applicant respectfully requests that the rejection of claims 1-23 under 35 U.S.C. 103(a) as being unpatentable over Hemming in view of Schubert and Ehrfeld be withdrawn. Should the rejection of claims 1-23 be maintained, Applicant respectfully requests that the Examiner articulate exactly which elements in Schubert correspond with each of the elements recited in the rejected claims.

Conclusion

The application in its amended state is believed to be in condition for allowance. Action to this end is courteously solicited. Should the Examiner have any further comments or suggestions, the undersigned would very much welcome a telephone call in order to discuss appropriate claim language that will place the application into condition for allowance.

Respectfully Submitted,

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